

STARPOWER

SEMICONDUCTOR

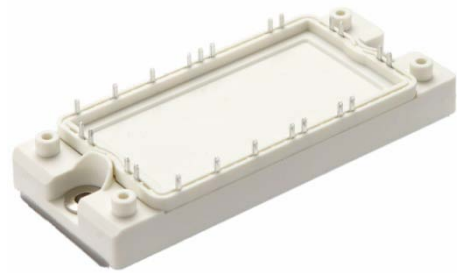
IGBT

GD75PIT60C5SN

Molding Type Module**600V/75A PIM in one-package**

General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.



Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 5 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

IGBT-inverter $T_C=25^\circ\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD75PIT60C5SN	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^\circ\text{C}$	600	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^\circ\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=55^\circ\text{C}$	87 75	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	150	A
P_{tot}	Total Power Dissipation @ $T_j=175^\circ\text{C}$	242	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	600			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V},$ $T_j=25^\circ\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V},$ $T_j=25^\circ\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.1\text{mA}, V_{CE}=V_{GE},$ $T_j=25^\circ\text{C}$	4.0	4.5	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=75\text{A}, V_{GE}=15\text{V},$ $T_j=25^\circ\text{C}$		1.70	2.15	V
		$I_C=75\text{A}, V_{GE}=15\text{V},$ $T_j=125^\circ\text{C}$		1.95		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=75A,$ $R_G=8.2\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		105		ns
t_r	Rise Time			54		ns
$t_{d(off)}$	Turn-Off Delay Time			104		ns
t_f	Fall Time			76		ns
E_{on}	Turn-On Switching Loss			0.65		mJ
E_{off}	Turn-Off Switching Loss			0.82		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=75A,$ $R_G=8.2\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		105		ns
t_r	Rise Time			54		ns
$t_{d(off)}$	Turn-Off Delay Time			109		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			0.75		mJ
E_{off}	Turn-Off Switching Loss			1.09		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		4.44		nF
C_{res}	Reverse Transfer Capacitance			0.13		nF
Q_G	Gate Charge	$V_{CC}=400V, I_C=75A,$ $V_{GE}=15V$		150		nC
I_{SC}	SC Data	$t_p \leq 5\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=360V,$ $V_{CEM} \leq 600V$		675		A

Diode-inverter $T_C=25^\circ C$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD75PIT60C5SN	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^\circ C$	600	V
I_F	DC Forward Current	75	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	150	A

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Vd tage	$I_F=75A, V_{GE}=0V$	$T_j=25^\circ C$	1.55	2.00	V
			$T_j=125^\circ C$	1.50		
Q_r	Recovered Charge	$I_F=75A,$ $V_R=300V,$ $R_G=5.1\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	3.7		μC
			$T_j=125^\circ C$	6.4		
I_{RM}	Peak Reverse Recovery Current	$I_F=75A,$ $V_R=300V,$ $R_G=5.1\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	95		A
			$T_j=125^\circ C$	105		
E_{rec}	Reverse Recovery Energy	$I_F=75A,$ $V_R=300V,$ $R_G=5.1\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	0.90		mJ
			$T_j=125^\circ C$	1.50		

Diode-rectifier $T_C=25^\circ\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD75PIT60C5SN	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^\circ\text{C}$	1600	V
$I_{F(AV)}$	Average On-state Current	75	A
I_{FSM}	Surge Forward Current $V_R=0V, t_p=10\text{ms}, T_j=45^\circ\text{C}$	600	A
I^2t	I^2t -value, $V_R=0V, t_p=10\text{ms}, T_j=45^\circ\text{C}$	1800	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=75\text{A}$ $T_j=150^\circ\text{C}$		1.32		V
I_R	Reverse Current	$T_j=150^\circ\text{C}, V_R=1600\text{V}$			3.0	mA

IGBT-brake-chopper $T_C=25^\circ\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD75PIT60C5SN	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^\circ\text{C}$	600	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^\circ\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=70^\circ\text{C}$	64 50	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	100	A
P_{tot}	Total Power Dissipation @ $T_j=175^\circ\text{C}$	179	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	600			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0V,$ $T_j=25^\circ\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0V,$ $T_j=25^\circ\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.4\text{mA}, V_{CE}=V_{GE},$ $T_j=25^\circ\text{C}$	4.0	4.9	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V},$ $T_j=25^\circ\text{C}$		1.65	2.10	V
		$I_C=50\text{A}, V_{GE}=15\text{V},$ $T_j=125^\circ\text{C}$		1.90		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=50A,$ $R_G=3.3\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		58		ns
t_r	Rise Time			31		ns
$t_{d(off)}$	Turn-Off Delay Time			80		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			0.41		mJ
E_{off}	Turn-Off Switching Loss			0.42		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=50A,$ $R_G=3.3\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		64		ns
t_r	Rise Time			37		ns
$t_{d(off)}$	Turn-Off Delay Time			90		ns
t_f	Fall Time			117		ns
E_{on}	Turn-On Switching Loss			0.69		mJ
E_{off}	Turn-Off Switching Loss			0.69		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		3.03		nF
C_{res}	Reverse Transfer Capacitance			0.09		nF
Q_G	Gate Charge	$V_{CC}=400V, I_C=50A,$ $V_{GE}=15V$		99		nC
I_{SC}	SC Data	$t_p \leq 5\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=360V,$ $V_{CEM} \leq 600V$		450		A

Diode-brake-chopper $T_C=25^\circ C$ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD75PIT60C5SN	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^\circ C$	600	V
I_F	DC Forward Current	30	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	60	A

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Vd tage	$I_F=30A, V_{GE}=0V$	$T_j=25^\circ C$	1.45	1.90	V
			$T_j=125^\circ C$	1.43		
Q_r	Recovered Charge	$I_F=30A$	$T_j=25^\circ C$	1.6		μC
			$T_j=125^\circ C$	2.3		
I_{RM}	Peak Reverse Recovery Current	$V_R=300V,$ $R_G=15\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	29		A
			$T_j=125^\circ C$	30		
E_{rec}	Reverse Recovery Energy		$T_j=25^\circ C$	0.33		mJ
			$T_j=125^\circ C$	0.40		

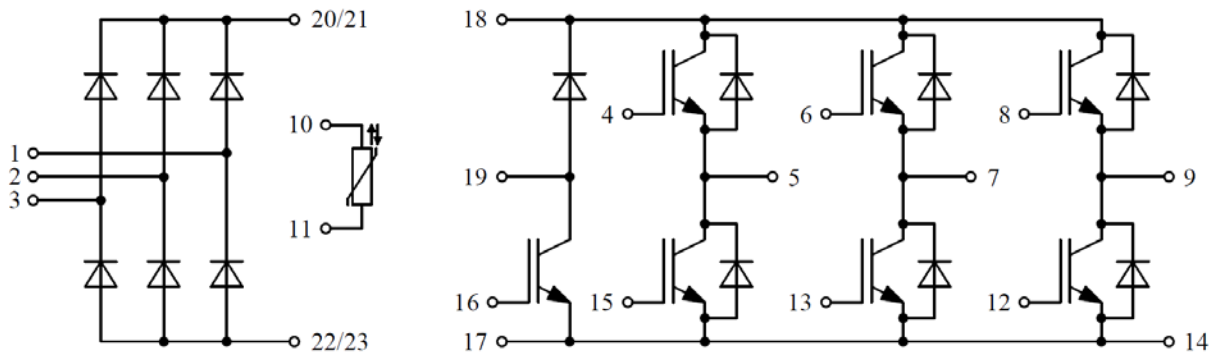
Electrical Characteristics of NTC $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		k Ω
$\Delta R/R$	Deviation of R_{100}	$T_C=100^\circ\text{C}, R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

IGBT Module

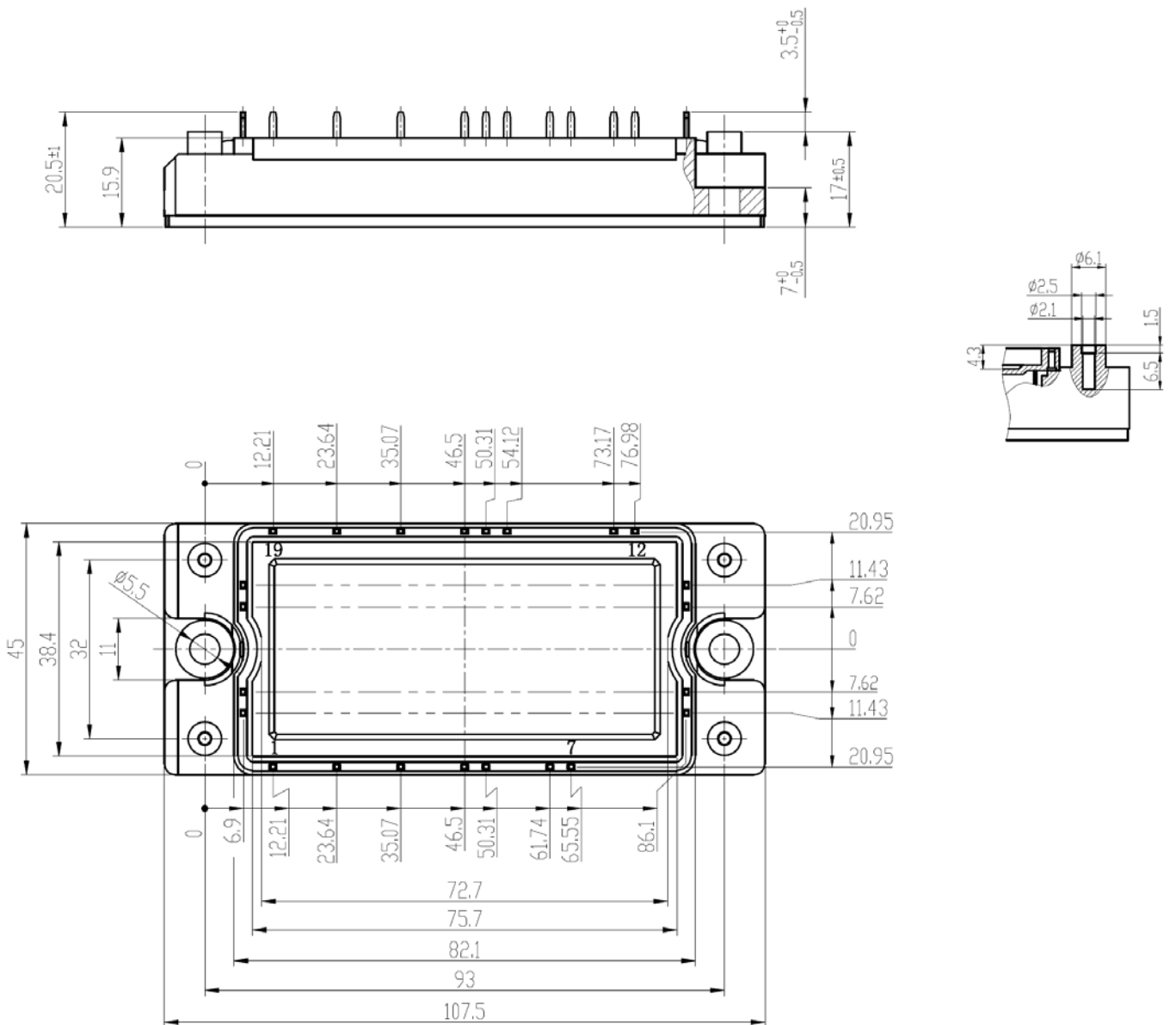
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000			V
L_{CE}	Stray Inductance		35		nH
$R_{\text{CC}'+\text{EE}'}$ $R_{\text{AA}'+\text{CC}'}$	Module Lead Resistance, Terminal to Chip @ $T_C=25^\circ\text{C}$		4.00 3.00		m Ω
$R_{\theta\text{JC}}$	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter) Junction-to-Case (per Diode-rectifier) Junction-to-Case (per IGBT-brake-chopper) Junction-to-Case (per Diode-brake-chopper)			0.621 1.024 0.910 0.838 1.625	K/W
$R_{\theta\text{CS}}$	Case-to-Sink (Conductive grease applied)		0.02		K/W
T_{jmax}	Maximum Junction Temperature (inverter, brake) Maximum Junction Temperature(rectifier)			175 150	$^\circ\text{C}$
T_{jop}	Operating Junction Temperature	-40		150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40		125	$^\circ\text{C}$
M	Mounting Torque, Screw:M5	3.0		6.0	N.m
G	Weight of Module		200		g

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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